

I WAS INVITED once to give a lecture to a large audience; the program was to begin at 8:00 in the evening. I followed my escort into the building through the stage entrance and stood in the wings as a microphone was put around my neck. I could see the first dozen rows: nobody had arrived. I assumed that 8:00 meant 8:15, as it might at an academic gathering, and was puzzled when my host walked on stage, nodded to the rows of empty seats, and went through the motions of introducing me. Resisting slightly, I was pushed gently out of the wings and toward the rostrum.

There were eight hundred people in the hall, densely packed from the thirteenth row to the distant rear wall. Feeling a little as though I were addressing a crowd on the opposite bank of a river, I gave my lecture. Afterwards, I asked my hosts why they had arranged the seating that way. They hadn't.

There were no seating arrangements and no ushers. The arrangement was voluntary, and could only reflect the preferences of the audience. What are we to suppose those preferences were?

It is possible that everybody preferred the whole audience to pack itself into the two dozen rows toward the rear, leaving the first dozen vacant. But, except for any example he set, nobody controlled where anybody else sat. People did not vote with their bottoms on a seating plan. All they did was to choose where to sit from among the available seats they could see as they scanned the hall while walking down the aisle.

Can we guess what policy people followed in choosing their seats? I should add that, as far as I could tell, nothing differentiated the people in different rows. People toward the front or rear did not seem to be older or better dressed or predominantly male or female. Those in the front—the thirteenth

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row—may have seemed more attentive than the rest but they probably knew that, even at that distance, I could see their eyelids droop or their heads nod, and were motivated to stay a little more alert.

Curious as I was, I neglected to ask my hosts about the order in which the different rows were filled. Did they fill in sequence from back to front? Did people distribute themselves at random among the rearward two dozen rows? Or did the first arrivals fill the thirteenth row, later arrivals filling the rows in sequence toward the rear? That last is improbable: it would be a coincidence if the earliest arrivals had chosen a forward boundary that would ultimately hold, densely packed, exactly the number of people who showed up. The dynamics had to be consistent with the populating of a compact area by people who could not know how many would be arriving later.

There are several reasons we might interest ourselves in what it is that those people were doing, or thought they were doing, or were trying to do, when they seated themselves in that way. One is that we do not like the result; we prefer they all be in the first twenty-four rows, not the last twenty-four, or distributed over the whole auditorium. If we want to change the pattern with a minimum of organization, interfering as little as possible with the preferences of the audience, we need to know whether we can subtly change their incentives or their perceptions of the auditorium so that they will "voluntarily" choose a better seating pattern.

And before we do any such thing we ought to know whether the audience itself likes the seating arrangement that it chose, and whether the fact that they chose their seats as they did is evidence that they must be satisfied with the outcome.

A second reason for interest is that there may be something about this process that reminds us of other situations in which people locate themselves voluntarily in some pattern that does not possess evident advantages even for the people who by their own choices form the pattern. Residential location is an

example. This laboratory experiment in the auditorium can give us hints of what to look for in other situations.

My immediate purpose in inviting you to speculate on the motives that led to that seating pattern is neither to develop a handbook of auditorium management nor to draw analogies with residential choice or the behavior of crowds or the filling of parking lots. It is to give a vivid example of what this book is about. What this book is about is a kind of analysis that is characteristic of a large part of the social sciences, especially the more theoretical part. That kind of analysis explores the relation between the behavior characteristics of the *individuals* who comprise some social aggregate, and the characteristics of the *aggregate*.

This analysis sometimes uses what is known about individual intentions to predict the aggregates: if we know that people entering an auditorium have a sociable desire to sit near somebody but always to leave one empty seat between them, we can predict something about the pattern that will appear when the entire audience has arrived. Alternatively this kind of analysis may do what I invited you to do—to try to figure out what intentions, or modes of behavior, of separate individuals could lead to the pattern we observed. If there are several plausible behaviors that could lead to what we observed, we can look for evidence by which to choose among them.

There are easy cases, of course, in which the aggregate is merely an extrapolation from the individual. If we know that every driver, on his own, turns his lights on at sundown, we can guess that from our helicopter we shall see all the car lights in a local area going on at about the same time. We could even get our compass bearings by reflecting that the cascade of lights on the Massachusetts Turnpike will flow westward as dusk settles. But if most people turn their lights on when some fraction of the oncoming cars already have their lights on, we'll get a different picture from our helicopter. In the second case, drivers are responding to each other's behav-

ior and influencing each other's behavior. People are responding to an environment that consists of other people responding to *their* environment, which consists of people responding to an environment of people's responses. Sometimes the dynamics are sequential: if your lights induce me to turn mine on, mine may induce somebody else but not you. Sometimes the dynamics are reciprocal: hearing your car horn, I honk mine, thus encouraging you to honk more insistently.

These situations, in which people's behavior or people's choices depend on the behavior or the choices of other people, are the ones that usually don't permit any simple summation or extrapolation to the aggregates. To make that connection we usually have to look at the *system of interaction* between individuals and their environment, that is, between individuals and other individuals or between individuals and the collectivity. And sometimes the results are surprising. Sometimes they are not easily guessed. Sometimes the analysis is difficult. Sometimes it is inconclusive. But even inconclusive analysis can warn against jumping to conclusions about individual intentions from observations of aggregates, or jumping to conclusions about the behavior of aggregates from what one knows or can guess about individual intentions.

Return to that audience of mine and speculate a little on the motives that might lead people to sit as they did. (We needn't assume that they all had the same intentions.) What are some plausible conjectures—alternative hypotheses—about what it is that those people were doing that could lead to the result I described? How do we evaluate the result in the light of each hypothesis? How might we influence the result, according to different hypotheses? How much leeway does each hypothesis allow for the role of chance, or architecture? And can we investigate the several hypotheses, to choose among them, or to reject them all and keep looking?

An obvious possibility is that everybody likes to sit as close to the rear as possible. The earliest arrivals get to sit farthest to the rear; late arrivals can wish they had come earlier,

but there's no way to improve on the outcome for the whole audience by switching people around because for everybody we might switch to the rear there would be somebody who had to go forward. Blocking off the last dozen rows would translate them all a dozen seats forward, if that's where we want them.

A second possibility, not the same thing, is that everybody wants to sit to the rear of everybody else—not to the rear of the hall, just behind the other people. (Maybe they like to get out first afterward.) They may prefer everybody else to be as far forward as possible, so they, too, can be as far forward as possible, still staying behind everybody. To do that the early arrivals sit far enough back to make allowance for later arrivals, who then sit behind them, not forward; or, if the early arrivals attribute the same behavior to those who will come later, they have to choose the row farthest to the rear or people will crowd in behind them. Again, blocking off the last dozen rows will translate them all forward, if that's where we want them, and maybe that's where they'd like to be. They just didn't get there.

A third possibility is that everybody wants to sit where he is close to people, either to be sociable or to avoid being conspicuously alone. If the first few arrivals happen to sit toward the rear, later arrivals will congregate there until the populated area has reached the back. From then on there's no room except toward the front, and to be near people the last arrivals fill the rows immediately forward of those who are already there. If we could get the first few people to sit toward the front, the same process would lead to the reverse result: late arrivals, finding the front full, would fill the rows immediately behind. Either way the early arrivals get surrounded and everybody is bunched. But in one case they are sitting down front and in the other toward the rear. We may like one result better. Or they may like it better.

A fourth possibility is that everybody likes to watch the audience come in, as people do at weddings. To avoid craning

their necks and being seen staring, they sit as far to the rear as possible and watch as people walk by and down the aisle. Once the audience is seated there is no advantage in sitting to the rear—either to the rear of the other people, or to the rear of the auditorium. If we could estimate the size of the crowd and block off the back rows, everybody could indulge his sightseeing and be twelve rows closer to what's going on, and there wouldn't be that embarrassing moat between the speaker and the audience. Or if we had people enter from the front instead of the rear, the early arrivals could combine better seats in front with the same opportunity to watch later arrivals come in.

Still another hypothesis is that most members of the audience developed their seating habits in other times and places, where they found disadvantages in sitting down front. Without thinking about it, they sat toward the rear as they always do, later realizing perhaps that there was no teacher to call on students in the front row and that they could just as well have sat forward and seen and heard better. And so forth. We could even propose that people are merely tired and take the nearest vacant seat when they enter the room. But that behavior would have to be coupled with a rule of decorum—that the first person in any row must go midway between the two aisles and the next people must move alongside to minimize the climbing over—for this "minimum effort" hypothesis to give us the result we observed.

There is one hypothesis that I find interesting because it is so minimal, yet sufficient. This is that nobody cares where he sits, as long as it's not in the very front—not in the first occupied row. Out of two dozen rows that might be partially filled, a person is indifferent among 23 of them. He just does not want to sit in the first one.

Actually, everybody may want to sit as far *forward* as possible, subject to the single proviso that he not be in the first occupied row. To be on the safe side, and not knowing how large the audience will be, people sit toward the rear; as it

begins to look as though most of the audience has arrived, people will climb over seated people to occupy empty seats in the crowded section rather than enter that vacant row just in front of everybody else.

Somebody, of course, ends up sitting in front of everybody. And they might all be just as happy, or happier, if the entire audience were shifted 12 rows forward. The people in the other 23 rows surely would prefer to have the whole crowd shifted forward.

An even weaker hypothesis is that people don't even mind being in the very first occupied row as long as the rows immediately behind them are filled, so they are not conspicuously down front by themselves. That can lead to the same result.

Purposive Behavior

Notice that in all of these hypotheses there is a notion of people's having preferences, pursuing goals, minimizing effort or embarrassment or maximizing view or comfort, seeking company or avoiding it, and otherwise behaving in a way that we might call "purposive." Furthermore, the goals or purposes or objectives relate directly to other people and *their* behavior, or are constrained by an environment that consists of other people who are pursuing their goals or their purposes or their objectives. What we typically have is a mode of *contingent behavior*—behavior that depends on what others are doing.

In other sciences, and sometimes in the social sciences, we metaphorically ascribe motives to behavior because something behaves *as if* it were oriented toward a goal. Water seeks its own level. Nature abhors a vacuum. Soap bubbles minimize surface tension and light travels a path that, allowing for different speeds through different media, minimizes travel time. But if we fill a J-shaped tube with water and close the lower end so that the water in the pipe cannot achieve its own level, nobody really supposes that the water feels frustrated. And if we then open the lower end of the tube so that most of the

water spills on the floor, nobody imputes shortsightedness to the water for having only spilt itself in seeking its own level. Most of us don't think that light is really in a hurry. Lately there are some amongst us who think that sunflowers are anguished if they cannot follow the sun, and we are told that leaves seek positions on trees that divide the sunlight among them to maximize photosynthesis. If we are in the lumber business we like the leaves to succeed, but not for their sake; we might not even be sure whether the leaves are acting on their own or are merely slaves to an enzyme, or parts of a chemical system for which words like "purpose" and "seek" are wholly nonascriptive and nonevaluative.

But with people it's different. When we analyze how people behave in trying to escape from a burning building we mean that they really are trying to escape. They are not simply acting "as if" they dislike being burnt. With people, in contrast to light beams and water, we usually believe we are dealing with conscious decisions or adaptations in the pursuit of goals, immediate or remote, within the limits of their information and their comprehension of how to navigate through their environment toward whatever their objectives are. In fact, we can often ascribe to people some capacity to solve problems—to calculate or to perceive intuitively how to get from here to there. And if we know what problem a person is trying to solve, and if we think he actually can solve it, and if we can solve it too, we can anticipate what our subject will do by putting ourselves in his place and solving his problem as we think he sees it. This is the method of "vicarious problem solving" that underlies most of microeconomics.

An advantage in dealing with "goal-seeking" unconscious substances, like the water that seeks its own level or, in biology, the genes that seek to protect and proliferate genes like themselves, is that we are not likely to forget that the motives we ascribe are no more than a convenience of expression, a suggestive analogy or a useful formula. With people, we can get carried away with our image of goal seeking and problem

solving. We can forget that people pursue misguided goals or don't know their goals, and that they enjoy or suffer subconscious processes that deceive them about their goals. And we can exaggerate how much good is accomplished when people achieve the goals we think they think they have been pursuing.

Nevertheless, this style of analysis undeniably invites evaluation. It is hard to explore what happens when people behave with a purpose without becoming curious, even concerned, about how well or how badly the outcome serves the purpose. Social scientists are more like forest rangers than like naturalists. The naturalist can be interested in what causes a species to become extinct, without caring whether or not it does become extinct. (If it has been extinct for a million years his curiosity is surely without concern.) The ranger will be concerned with whether or not the buffalo do disappear, and how to keep them in a healthy balance with their environment.

What makes this evaluation interesting and difficult is that the entire aggregate outcome is what has to be evaluated, not merely how each person does within the constraints of his own environment. In a burning building it may be wise to run, not walk, to the nearest exit, especially if everybody else is running; what has to be evaluated is how many get safely out of the building if, each doing the best he can to save himself, they all run. Everyone who entered my auditorium may have done a good job of picking the best seat available at the moment he entered the room. (Some may have wished, after all eight hundred had taken their seats, that they *had* sat a little farther front when they saw where everybody else sat and how many others arrived.) But the most interesting question is not how many people would like to change their seats after they see where everybody else is sitting; it is whether some altogether different seating arrangement might better serve the purposes of many, or most, or all of them.

How well each does for himself in adapting to his social environment is not the same thing as how satisfactory a social environment they collectively create for themselves.

Market Behavior

Among the social sciences the one that conforms most to the kind of analysis I have been describing is economics. In economics the "individuals" are people, families, owners of farms and businesses, taxi drivers, managers of banks and insurance companies, doctors and school teachers and soldiers, and people who work for the banks and the mining companies. Most people, whether they drive their own taxis or manage continent-wide airlines, are expected to know very little about the whole economy and the way it works. They know the prices of the things they buy and sell, the interest rates at which they lend and borrow, and something about the pertinent alternatives to the ways they are currently earning their living or running their business or spending their money. The dairy farmer doesn't need to know how many people eat butter and how far away they are, how many other people raise cows, how many babies drink milk, or whether more money is spent on beer than on milk. What he needs to know is the prices of different feeds, the characteristics of different cows, the different prices farmers are getting for milk according to its butter fat content, the relative costs of hired labor and electrical machinery, and what his net earnings might be if he sold his cows and raised pigs instead or sold his farm and took the best job for which he's qualified in some city he is willing to live in.

Somehow all of the activities seem to get coordinated. There's a taxi to get you to the airport. There's butter and cheese for lunch on the airplane. There are refineries to make the airplane fuel and trucks to transport it, cement for the runways, electricity for the escalators, and, most important of all, passengers who want to fly where the airplanes are going.

The fact that there is never a taxi when you need one in the rain, or that you can fly 3,000 miles more comfortably than you can fly 300 and flights are occasionally overbooked, reminds us how spoiled we are. We expect this fantastically complex

system to be even better coordinated than it sometimes is. Tens of millions of people making billions of decisions every week about what to buy and what to sell and where to work and how much to save and how much to borrow and what orders to fill and what stocks to accumulate and where to move and what schools to go to and what jobs to take and where to build the supermarkets and movie theatres and electric power stations, when to invest in buildings above ground and mine shafts underground and fleets of trucks and ships and aircraft—if you are in a mood to be amazed, it can amaze you that the system works at all. Amazement needn't be admission: once you understand the system you may think there are better ones, or better ways to make this system work. I am only inviting you to reflect that whether this system works well or ill, in most countries and especially the countries with comparatively undirected economic systems, the system works the way ant colonies work.

It is generally not believed that any ant in an ant colony knows how the ant colony works. Each ant has certain things that it does, in coordinated association with other ants, but there is nobody minding the whole store. No ant designed the system. An important part of social biology is relating the world of the individual ant to the world of the ant colony. The colony is full of patterns and regularities and balanced proportions among different activities, with maintenance and repair and exploration and even mobilization for emergencies. But no individual ant knows whether there are too few or too many ants exploring for food or rebuilding after a thunderstorm or helping to carry in the carcass of a beetle. Each ant lives in its own little world, responding to the other ants in its immediate environment and responding to signals of which it does not know the origin. Why the system works as it does, and as effectively as it does, is a dynamic problem of social and genetic evolution. How it works—how it is that the limited set of choices made by each ant within its own truncated little world translates, in the aggregate, into the rich and seemingly

meaningful pattern of aggregate behavior by which we describe the society and the economy of the ant—is a question akin to the question of how it is that all the cows know how much milk is needed to make the butter and the cheese and the ice cream that people will buy at a price that covers the cost of maintaining and milking the cow and getting each little piece of butter wrapped in aluminum foil with the airline's own insignia printed on it.

What I asked you to be amazed at, and not necessarily to admire, is simply the enormous complexity of the entire collective system of behavior, a system that the individuals who comprise the system needn't know anything about or even be aware of. If we see pattern and order and regularity, we should withhold judgment about whether it is the pattern and order of a jungle, a slave system, or a community infested by parasitic diseases, and inquire first of all what it is that the individuals who comprise the system seem to be doing and how it is that their actions, in the large, produce the patterns we see. Then we can try to evaluate whether, at least according to what the individuals are trying to do, the resulting pattern is in some way responsive to their intentions.

In economics it often appears that a lot of this unmanaged and unguided individual activity leads to aggregate results that are not too bad, indeed about as good as could be expected if somebody took command and figured out what ought to be done and had a way to get everybody to do what he was supposed to do. Two hundred years ago Adam Smith characterized the system as one that worked *as if* some unseen hand brought about the coordination.

Actually, economists do not usually make careful observations, compare what they observe with alternatives they can imagine, and judge the results to be good. What they do is to infer, from what they take to be the behavior characteristics of people, some of the characteristics of the system as a whole, and *deduce* some evaluative conclusions. If Canadian farmers ship too many Christmas trees to Albany and not enough to

Buffalo, sellers in Buffalo will be able to sell their trees for more than trees are going for in Albany and somebody will buy trees in Albany and send them overnight by truck to Buffalo and the next day there will be a more "balanced" distribution of trees between the two cities, the balance reflecting how badly people in the two cities want Christmas trees compared with the other things that their money will buy. And so forth.

The result is often characterized by the statement that "the market works." By "market" is meant the entire complex of institutions within which people buy and sell and hire and are hired and borrow and lend and trade and contract and shop around to find bargains. A lot may be wrong with the deductive reasoning of economists, but when they state the conclusion carefully and modestly they have a point. The free market may not do much, or anything, to distribute opportunities and resources among people the way you or I might like them distributed, and it may not lead people to like the activities we wish they liked or to want to consume the things we wish they wanted to consume; it may encourage individualist rather than group values and it may fail to protect people against their own shortsightedness and self-indulgence. It may lead to asymmetrical personal relationships between employee and employer, lender and borrower, and attach too much status to material attainments. The market may even perform disastrously where inflation and depression are concerned. Still, within those serious limitations, it does remarkably well in coordinating or harmonizing or integrating the efforts of myriads of self-serving individuals and organizations.

For my purpose there's no need to reach a judgment about just how well the "free market" does what is attributed to it, or whether it does it at a price worth paying. I am interested here in how much promise the economist's result has outside economics. If economists have studied the matter for two hundred years and many of them have concluded that a comparatively unrestricted free market is often an advantageous way of letting individuals interact with each other, should we suppose

that the same is true in all the rest of those social activities, the ones that do not fall under the heading of economics, in which people impinge upon people as they go about pursuing their own interests? Presently I shall enumerate and discuss some of those other activities (aside from choosing seats in an auditorium), but as illustration let me mention the languages we speak and how we speak them, whom we marry and whether we have children and what names we give our children, whom we live near and whom we choose for friends, what games we play and what customs we develop, what fashions we pursue, whether we walk the streets or stay indoors, how we drive cars or make noise or smoke in public, the pets we keep and how we manage them. Then there are eating and drinking habits, and the times of day for going to lunch; littering and habits of cleanliness and sanitation; the transmission of jokes and gossip and news and useful information; the formation of parties and movements; and whether we wait in line for our turn.

All of these are activities in which people's behavior is influenced by the behavior of others, or people care about the behavior of others, or they both care and are influenced. Most of these activities are substantially free of centralized management in many societies, including our own, or subject to sanctions and proscriptions that work indirectly. (The dictionary may eventually tell me what a seven-year-old means by "dynamite," but that's not where the seven-year-old learned to say it.) And though people may care how it all comes out in the aggregate, their *own* decisions and their *own* behavior are typically motivated toward their *own* interests, and often impinged on by only a local fragment of the overall pattern. Hardly anybody who marries a tall person, or a short person, is much motivated by what it will do to the frequency distribution of body height in the next generation. But the next generation's notions of what is tall and what is short will be affected by whether in this generation tall people marry tall people and short people short, or tall and short marry each other, or everybody marries at random.

Equilibrium Analysis

In a moment I am going to argue that there is no presumption that the self-serving behavior of individuals should usually lead to collectively satisfactory results. Economics covers a special case—a large and important special case, but a special case—and I am going to identify what makes economics a special case.

But before that I need to dispose of a false issue that gets too much attention. A method of analysis that is common in economics, common in biology, and common also in many of the non-life-related sciences, is the study of "equilibrium." An equilibrium is a situation in which some motion or activity or adjustment or response has died away, leaving something stationary, at rest, "in balance," or in which several things that have been interacting, adjusting to each other and to each other's adjustment, are at last adjusted, in balance, at rest. If you pour cream in your coffee there will be one kind of "equilibrium" when the surface has stopped rippling, and another when the cream is either dispersed evenly through the coffee or floating as a film on the surface. In economics there is an "equilibrium" distribution of Christmas trees, relative to the demand for Christmas trees, if prices are similar enough from city to city, or city to suburb, so that nobody can make money by moving trees from downtown to the suburbs or from Albany to Buffalo. There is equilibrium in the market for gasoline if prices from place to place do not differ more than transport costs between those places, and if the average price is one at which the amount of gasoline that people are willing to buy is in balance with the amount that producers can profitably put on the market. And so forth.

An equilibrium can be exact or approximate. It can be always approached but never quite achieved, the potential equilibrium itself continually changing. And equilibrium can be partial or more complete, short run or long run. Christmas

trees can be in balance among the cities, but an overall oversupply means that shippers of Christmas trees will lose money this year and next year fewer trees will be provided and the market may or may not be in equilibrium by next year or the year after.

The point to make here is that there is nothing particularly attractive about an equilibrium. An equilibrium is simply a result. It is what is there after something has settled down, if something ever does settle down. The idea of equilibrium is an acknowledgment that there are adjustment processes; and unless one is particularly interested in *how* dust settles, one can simplify analysis by concentrating on what happens after the dust has settled. In Malthusian analysis, the population is "in equilibrium" when the supply of food and other natural resources is so meager, relative to the population, that a low birthrate and a high death rate keep the population stationary. A public beach in the summertime is in equilibrium when it is so crowded that it is no longer attractive to anyone who might have wanted to go to the beach, but not quite so unattractive that the people who are already there give up and go home. The world's whale population is in equilibrium when the remaining whales are so few that hardly anybody can catch enough to make a good business out of it, and the few whalers who have nothing better to do are just able to catch enough whales to offset the new births in the small population. Highway speeds are in equilibrium vis-a-vis the state police when arrests are just frequent enough to offset the urge to drive a little faster. And so forth.

There may be many things wrong with "equilibrium analysis," including the possibility that it oversimplifies by neglecting processes of adjustment, or exaggerates the prevalence of equilibrium by neglecting shifts in the parameters that determine the equilibrium. But nobody should resist "equilibrium analysis" for fear that, if he acknowledges that something is in equilibrium, he will have acknowledged that something is all right. The body of a hanged man is in equilibrium when it

finally stops swinging, but nobody is going to insist that the man is all right. An unnecessary source of distrust of economic analysis is the assumption that when an economist discusses equilibrium he is expressing approval. I believe that assumption is usually—not always, but usually—a mistake.

The difference between economics and those other social phenomena will not, therefore, be a difference in the mode of analysis, and especially will not be that the one deals with equilibrium systems, rightly or wrongly, and the others do not. An economist would describe the seating pattern in our auditorium in terms of equilibria just as he would the market for air conditioning. The seating pattern is an equilibrium if, considering where everybody else is sitting, nobody is motivated to move to another seat. Calling it an equilibrium does not imply that everybody—or even anybody—likes the seating arrangement, only that nobody alone can do better by changing to any available seat. Nor does it imply that there are not alternative seating patterns, very different ones, that could also be equilibria.

Exchanges and Other Transactions

To identify what makes economics a large and important special case, rather than a model for all social phenomena, let me remind you of the particular characteristics of all of these behavior systems that I am trying to focus on. It is that people are impinging on other people and adapting to other people. What people do affects what other people do. How well people accomplish what they want to accomplish depends on what others are doing. How you drive depends on how others drive; where you park depends on where others park. Your vocabulary and your pronunciation depend on the vocabularies and accents of others. Whom you marry depends on whom you meet, who will marry you, and who is already married. If your problem is that there is too much traffic, you are part of the problem. If you join a crowd because you like crowds, you

add to the crowd. If you withdraw your child from school because of the pupils he goes to school with, you remove a pupil that *they* go to school with. If you raise your voice to make yourself heard, you add to the noise that other people are raising their voices to be heard above. When you cut your hair short you change, ever so slightly, other people's impressions of how long people are wearing their hair.

Sometimes you care what it is that the others are doing: you wish fewer were driving when the traffic gets thick. Sometimes you don't care but you need to adapt: it doesn't matter whether you have the right-of-way going uphill or downhill, as long as you know who has the right-of-way. Usually you both care and are influenced. (If you neither care nor are influenced, then it's outside what this book is about.)

Now for what is special about economics. Economics is mainly concerned with transactions in which *everybody affected is a voluntary participant*. The epitome is trading vegetables for eggs over the back fence. On certain conditions, this is a "good thing." You wouldn't do it unless you wanted the eggs more than the vegetables and your neighbor wouldn't unless he wanted the vegetables more than the eggs. Nobody else cares or needs to know whether you have a hard boiled egg or a lettuce-and-tomato sandwich for lunch.

Of course this is an exaggeration:

Eggs may have more cholesterol than is good for you.
Your neighbor may steal eggs because he knows that you'll trade vegetables for them.
Somebody may believe that chicken farms are cruel.
The neighbor who traded with you may have known that the egg was diseased.
And, when he cooks the cabbage you traded him, the family upstairs may be offended by the smell.

Still, the traditional subject of economics has been voluntary exchanges, exchanges that do not have major implications for all the people who do not participate in the transaction and who have no opportunity to veto it. If anybody affected is part

of the transaction; if the transaction is voluntary and anybody who legitimately objects can veto it; if the transaction is easy to recognize and people know their own interests, so that interested parties can protect their interests by participating or blocking the transaction; if people do not make themselves vulnerable to theft and extortion and the like when they manifest an interest in the transaction; if the people who bring their vegetables to market will be protected against theft; and, if the law will prevent people from improperly creating demand for their products by poisoning other people's chickens, then there is a lot to be said for treating "free-market exchange" as a good thing. At least it is a good thing if we think it a good thing for people to have more of what they like when they can have it at nobody else's expense.

There are a lot of requirements for making the free market work well, or even work at all. In addition to physical protection and contract enforcement, there has to be a lot of shopping around so that people know what trades are available, or enough information so that without shopping around people know what to expect when they buy or sell. Behind a typical free market is centuries of patient development of property rights and other legal arrangements, and an extraordinary standardization of goods and services and the terminology for describing them. Think of all the things you can actually purchase by telephone, confident that you will get what you asked for or be able to tell the difference at a glance. A lot of legal and institutional arrangements are designed to protect the rights of people who might, though affected by a transaction, be left out of it.

Economists are aware of a multitude of reasons why markets may not work to everybody's satisfaction. I have mentioned some. People lack the knowledge to shop around for medical care. It is hard to tell a good secondhand auto from a bad one, or a fraudulent repair job from an honest one. It is hard to sell a secret without giving it away. Some markets are easily monopolized, and economists don't expect monopolized

markets to work well. In identifying these problem cases, economists customarily ask why it is that the market doesn't work, and they have a pretty good checklist to help them in their diagnoses. The market for brave watchmen will fail if the obligation to be brave in an emergency is unenforceable; for life insurance if the insurance company cannot tell who the high-risk customers are but the high-risk customers know; for cancer medicine if people are misinformed or superstitious about what will cure their affliction, or easily mistaken about whether they have the disease; for dangerous machinery if people are ignorant of the dangers; for broadcast news and weather reports if everybody can listen free of charge; for public swimming pools if users cannot be monitored against fouling the pool; for betting on sports events if heavy bettors can interfere in the health and safety of the players; for telephone service if some part of the enterprise has to be consolidated into a single interconnected network, hence a monopoly; for right-of-way at an intersection because the drivers of competing cars and trucks have no way to communicate offers and agreements.

Notice that in all these cases there was some initial reason to expect that the market might work. Upon inspection it turns out that although the market indeed can work for certain kinds of medicine and certain kinds of information and certain kinds of insurance and certain kinds of performance contracts, it might not work, or not work well, for these particular kinds, for reasons that can be analytically diagnosed.

There are also the markets we don't like that work entirely too well; for example, the market for stolen goods, which encourages burglary, the markets for votes and fixed traffic tickets and political favors and falsified inspection certificates, even a market for kidnapped businessmen—things that are not supposed to be for sale.

I'll complain if nobody buys my book, especially if somebody writes a better one and gets all the business, but I probably shouldn't blame that on "the market." When I mentioned that economics is mainly concerned with market transactions

in which everybody affected is a voluntary participant I should have mentioned a qualification: if you buy somebody else's book, I may feel "affected" by the transaction because the alternative I had in mind was selling you my book instead. I can wish that people wanted, and would pay for, the things I have to offer, and would offer me, at attractive prices, the things I would like to buy; but this is more like wishing for transactions that didn't occur than objecting to some that did.

What the market is often so good at doing is only part of what happens in the market. While coordinating activities efficiently, the market may produce a distribution of income that you and I do not like, either in general, or just because of where it leaves us. This is why I invited only your amazement, not your admiration, of what the market can perform (or, even if your admiration, not necessarily your unqualified approval).

But now look at an activity that at first glance is like a "market activity" but upon closer inspection isn't. To make my point I'll choose a non-controversial illustration familiar to most of us, the "non-market" for Christmas cards. There is a literal market for Christmas cards—a market for buying them, and a federally monopolized market for sending them by mail. But I mean the choosing of whom to send a card to, what kind of card, how expensive, by what date to mail it, whether to open a message, and what to do about non-Christian addressees. In addition to personal greetings we have cards from teachers to students and students to teachers, elected officials to their constituents and insurance salesmen to their policyholders, and, of course, from your paperboy or papergirl.

My impression—and I've found nobody who doesn't share it—is that the sending of Christmas cards is an "interactive process" greatly affected by custom and by expectations of what others expect and what others may send, by cards received (and not received) last year and already received this year, conditioned of course by the cost of cards and postage and the labor as well as the fun or nuisance of selecting cards and penning inscriptions.

People feel obliged to send cards to people from whom

they expect to receive them, often knowing that they will receive them only because the senders expect to receive cards in return. People sometimes send cards only because, cards having been sent for several years, cessation might signal something. People send cards early to avoid the suspicion that they were sent only after one had already been received. Students send cards to teachers believing that other students do. Sensible people who might readily agree to stop bothering each other with Christmas cards find it embarrassing, or not quite worth the trouble, to reach such agreement. (If they could, they might be so pleased that they would celebrate by sending "voluntary" cards, falling back into the trap!)

My casual inquiry suggests widespread if not unanimous opinion that the system has some of the characteristics of a trap. Even people who, on balance, like Christmas cards find parts of the system ludicrous, preposterous, or downright infuriating. Some wish the whole institution could be wiped out. Some wish for a "bankruptcy" proceeding in which all Christmas-card lists could be obliterated so people could start over, motivated only by friendship and holiday spirit, without accumulated obligations.

Nobody claims that the system reaches optimal results. Even if everybody guesses correctly the cards he will receive, and ends the holiday season with no regrets for the cards he sent and the cards he didn't send, the outcome is a long way from ideal. And there isn't much that anybody can do about it. Fortunately, it doesn't matter much.

At first glance someone might call this exchange of greetings a "free market activity." But "exchange" is an ironic metaphor. And "market" is a remote and unhelpful analogy. Things don't work out optimally for a simple reason: there is no reason why they should. There is no mechanism that attunes individual responses to some collective accomplishment.

It cannot even be argued that if the whole system worked badly enough it would become extinct. There is no mechanism that would induce people to stop sending cards merely

because everybody, like everybody else, deplored the system and wished it would disappear.

There was a time when wise people thought planets should revolve in circles. When observation showed incontrovertibly that they did not, the question was asked, "Why not?" People tried to figure what kept the planets from displaying perfect circles. In the end it was realized that, in accordance with the laws of motion and gravitation, there never had been any reasons to expect circles. Circles were not the norm; ellipses were.

When we ask why the "free market" in Christmas cards doesn't lead to optimal exchange, the answer is that it is not a market and there was no reason to expect optimal results in the first place. The free market, when it works, is that special case of knowledgeable voluntary exchange of alienable commodities. Only some ellipses are circles.

Contrived Markets and Partial Markets

I must add two qualifications, one that enlarges the scope for market arrangements and one that reduces it. The first is that it is often possible, by legal and institutional innovation, to endow activities with the characteristics that make markets. The legal invention of "copyright" makes the written word a marketable commodity. Just as a woodcutter wouldn't cut wood if bystanders were free to carry it away as fast as he cut it, writers might not write if people could freely copy everything they so painfully and skillfully compose. Property law doesn't let me pick your vegetables and give them to my friends; by extending the concept of "property" to original compositions, the law does not permit me to sell a copy of what *you* have written until you sell me the right to do it.

The beach that is so overcrowded on a hot day that many people are not attracted and some leave in disgust (and even those that remain don't enjoy it much) can be better exploited by the people to whom the beach belongs if attendance is regulated by an admission fee, the proceeds accruing to the people

whose beach it is. Or admissions can be rationed among beachgoers, in numbers calculated to enhance the collective enjoyment of the beach, with people who adore bathing free to buy admissions from people who would rather have more money than swim.

These are not "free-market arrangements." They require the intervention of some authority to set up a system of management. But the system is modelled on market principles. Creating something like a market is a principle of wide usefulness. But is far from universally applicable. It works with the crowds at public beaches but not with the crowds that gather to watch a building burn, obstructing the firefighters and causing the building to burn more brightly. Copyright laws will not keep people from passing malicious rumors, or spoiling a suspense movie by telling its ending.

The second qualification is that markets often appear to work toward greater harmony than they do. Some social consequences have been left out of account. A market appears to do a pretty good job of allocating houses and apartments to people who need places to live. But it matches people only with living quarters, not with neighbors; the demographic, ethnic, and cultural patterns of living will be determined in the entire interactive process of choosing homes and neighbors and neighborhoods. The market transactions involve only the landlord and tenant.

The market may appear to work well for the production and distribution of perfumes, deodorants, and portable radios, but there is no market which determines their use or non-use by locally interested parties.

The market for pets does not reflect the interest of bird lovers in the market for cats, or of cat lovers in the market for dogs, or the interest of people who walk sidewalks in the market for animals that foul the footpath. Indeed, the interactive phenomenon of pet ownership, and the training and management and mismanagement of pets, is an extensive social activity of which only a modest part shows up in the market

for animals, animal food, veterinary services, and, occasionally, poison.

Of all the activities that fall within my subject one of the most important is on the borderline of "market arrangements." That is marriage. Aside from everything else that it is, marriage in this country is a voluntary contractual arrangement between people who are free to shop around. The parties most affected are the two who make the contract. Each offers something complementary to the other, and there is expected an economic division of labor. The relationship is asymmetrical in many ways; but so are the contractual relations between people and their nursemaids, housekeepers, business partners, mountaineering guides, tutors, pilots, and income-tax accountants. There is more here than just a remote analogy with long-term bilateral exclusive-service contracts. The legal status is somewhat contractual and becoming more so; and one can imagine secular societies in which marriage would be assimilated to contract law. To refuse on sentimental or religious grounds to acknowledge this is to miss an important characteristic of getting married.

But to treat it as just another private long-term reciprocal exclusive-service contract would be to miss even more important characteristics of marriage. Except for the very rich, the very famous, and sometimes the ethnically loyal, marriage is very privately motivated. The marriage choice is constrained very much by language, religion, geography, and education, but people get married because they want to and the selection of a mate is not part of a genetic or cultural plan. Yet marital choices in the aggregate have enormous influence on the genetic, religious, linguistic, socio-economic, and geographical makeup of the next generation. Marriage itself, children aside, affects language and religion and social mobility and the dispersion or concentration of tastes and habits and customs. Even the unmarried are greatly influenced by the frequency of marriage in their age group. Racial and religious separatism are drastically affected by the racial and religious makeup of married

couples. Economic and occupational mobility are affected by the matching or non-matching in marriage of income levels and occupational backgrounds, skills and talents and intelligence, disabilities and handicaps.

The social consequences of marriage make this activity one of the central phenomena in the landscape of social science. The fact that it is in important respects a market process only informs us about one of its dimensions.

Interactive Behaviors

It is time to give a more extensive enumeration of social activities of the kind I have been discussing. To begin, go back to the audience in the auditorium and branch out from there. That audience was an example of *spatial distribution*. Besides auditoriums it occurs in the way people distribute themselves on beaches or toward the front of a bus, in the way people who push out of a crowded theatre stand idly on the sidewalk afterwards blocking the egress of the people still pushing out of the theatre, the way people congregate at standup parties and receptions, and the way people form crowds at a rally, a riot, or a spectacle. On a larger scale it shows up in residential patterns. In motion it occurs in racing for the exit in a baseball park or evacuating the parking lot after the ballgame, in the spacing of cars on a highway, and in the arrival times of people who form queues to board a plane or to take seats at a performance.

There is no single mode of behavior that covers all these cases. Sometimes people want to be close, sometimes spread out; the people on the edge of a crowd may be pushing to get in and the people in the middle are being crushed. If everybody likes to be in the middle of a crowd, the crowd will be dense; if everybody prefers to be on the edge of a crowd, the crowd will be dispersed, and may even fail to be a crowd.

More complex is the behavior of people who want to be close to or distant from particular kinds of other people.

People get separated and integrated by sex, race, age, language, dress or social status, or by patterns of acquaintance and friendship. The motives of individuals can lead to striking and unexpected collective results.

At many colleges that have recently become co-educational, or have recently given up segregating the sexes, the question arises, how might the men and the women distribute themselves among the several dormitories or dining rooms if they were free to choose the ratios of men and women that they prefer to live with? At Harvard in the 1970s there were a dozen houses for a population one-third women. A quite limited set of possibilities is consistent with these numbers. Four houses could be filled with women, eight with men. Twelve houses could be one-third women. Eight houses could be half and half with the other four all men. One house could be for women, four half and half, three houses two to one, and four all men. And so forth.

Insight can be obtained even by supposing only two houses. Make it dining halls rather than sleeping quarters, and suppose either hall can hold most of the population if packed in tightly. How will the men and women distribute themselves between the two dining halls if they are free to choose between the male-female ratios in these two locations.

In the easiest case, all the men and all the women prefer a one to one ratio and will choose the dining room in which the numbers are most nearly equal. Suppose that there are 120 women and 100 men, that the women have to choose in advance, and that everybody knows that everybody prefers 50-50.

The women expect the men to distribute themselves proportionately to the women in the two dining rooms, and, if the women don't like overcrowding, they distribute themselves equally between the two rooms.

Now the men arrive, and by the time three-quarters of them have arrived there may be 40 in one hall and 35 in the other. The later arrivals notice a slight discrepancy and choose

the dining room with the more nearly equal number. In one room there are 60 women and 40 men, and in the other 60 and 35. The room with 40 men is slightly more attractive, and the next arrivals go there, and now there are 50 men in that room, 35 in the other. The difference is now more noticeable, and the next 10 men enter the hall with more men and there are 60 men and 60 women in that one, 35 men and 60 women in the other. The last 5 men much prefer the room with more men, and they make it 60 to 65 in that room, leaving it 60 to 35 in the other.

If men in the other room are now free to change their minds, maybe 10 of them will consider it worth the trouble to get up and change rooms, the near equality in the other room being appreciably better than the almost 1:2 ratio where they are. When the 10 arrive in the other room they change the ratio there to 75:60, spoiling the near equality, but leaving it 25:60 in the room they left, where some more men, now outnumbered nearly 3:1, prefer to go where the ratio is 5:4. Another 15 change rooms, leaving behind 10 men at a ratio of 6:1, making it 90:60 in the crowded room. Three to two is better than 6 to 1, so the last 10 go to the crowded room, raising the ratio there to 100:60.

The final score: all the men, preferring 50:50, have achieved 100:60. Half the women are outnumbered 1.6 to 1 and the other half will dine without men. No man will move.

If we forceably moved 40 men to the all-woman dining hall, *all* the men would enjoy a more satisfactory ratio, and so would all the women. But the 40 won't stay: the room with more men is always more attractive, even though both become less attractive as men migrate to the more attractive ratio.

At last the women committed to the dining room in which there are no men will insist on moving too, and everybody ends up in a very crowded room.

This quick illustration—an example, incidentally, of “equilibrium analysis”—is not for drawing conclusions. It is here to stimulate curiosity. Because association and proximity—in resi-

dence or social gatherings or working places, even marriage—are such pervasive phenomena, in later chapters we explore processes by which people become mixed or separated in accordance with age, income, sex, race, or language.

Marriage has been discussed as an example of the phenomena we are discussing, but some additional dimensions are worth mentioning. Age at marriage, and age differences between spouses, are affected by the ages at which others marry. Divorce and the prospects of remarriage depend on whether there is a high rate of turnover in particular age brackets. Especially if divorced people are likely to marry divorced people, a high divorce rate can make divorce more promising.

Language is an almost completely adaptive behavior. What language a person speaks depends on what languages he encounters, particularly within his own family. But the concentration and dispersion of languages in bilingual or linguistically separated countries like Canada, Finland, Switzerland, and earlier Israel or the United States, display trends that, though somewhat guided and sanctioned and stimulated by schools, government, broadcasting and signposting, result from individual decision and response. Accent, grammar and vocabulary are even more individualist in origin, slang being an outstanding example.

Each academic profession can study the development of its own language. Some terms catch on and some don't. A hastily chosen term that helps to meet a need gets imitated into the language before anybody notices what an inappropriate term it is. People who recognize that a term is a poor one use it anyway in a hurry to save thinking of a better one, and in collective laziness we let inappropriate terminology into our language by default. Terms that once had accurate meanings become popular, become carelessly used, and cease to communicate with accuracy. Sometimes a nugget is discovered, a word freighted with just the right set of meanings to meet a real need and to be popularly elected into the vocabulary. I

invite you to read on with an ear alert for examples of the good, the bad, and the ugly.

Like language are the communication systems that develop out of the unmanaged behaviors of individuals—the diffusion of rumor, gossip, and news, information and misinformation about sex and cooking and gardening and automobile repair; the circulation of jokes and stories and folklore; and the rules for playing games and adjudicating disputes. Everybody who participates in a communication system is part of the system. His participation maintains it or repairs it or transforms it or, sometimes, helps to cause it to wither away or collapse. People who pass along tips on the stock market or the horse races, where-to-get-it-wholesale, what movies to see or what restaurants to patronize, how to avoid getting caught, whom to date, and where to go for help, are simultaneously involved in two related activities. They are transmitting particular information over the network; and they are exercising the network.

Information networks, racial separation, marital behavior, and language development are often overlapping and interlocking. It is commonly observed that the work force of a shop or store or taxi company or motel is homogeneous. Whether it is Irish or Italian, Cuban or Puerto Rican, black or white, Protestant or Catholic, the homogeneity suggests purpose or design. But the determinant is likely to be a communication network. Positions are filled by people who learn of openings; people learn of the openings from acquaintances who already work there; acquaintances are from the same schools and neighborhoods and families and churches and clubs. And, the nearest thing to a guarantee that a new employee can have is an older employee who vouches for him.

I cannot resist digressing to describe an instance of segregation in which I used to participate. On birthdays I occasionally took a group of youngsters to watch the Red Sox. The second or third time I noticed, and confirmed the fourth and fifth time, that I sat in a section full of people who were remarkably like us—in their colors, accents, behavior, and

dress. There was no overt segregation. The seats cost the same, so I wasn't sitting among people who could afford the seats I could afford. There were ten ticket windows, and the lines at all the windows were a mixture of young and old, black and white, male and female, well-dressed and poorly dressed, noisy and quiet. Why did we always end up sitting among people like us?

It was years before I learned the answer. Birthday parties require coordination, so I bought seats in advance. I bought them at the Harvard Square subway station. Most people want seats together, and the ticket agent will have fewer odd tickets left over if he gets a block of seats to begin with. So I sat with the people who bought tickets from the same block—with the people who bought seats in advance at Harvard Square. (My story stops there, but there are exciting tales of people whose romances got started because they used the same Laundromat.)

To continue with our listing, the subject includes systems of deference, etiquette, social status, and hierarchy. It includes "street behavior"—being on the streets or staying off; staring ahead or nodding hello; asking for directions, matches, the time of day, or spare change; and carrying weapons. It includes the formation of mobs and riots, panic behavior, rules of the road, traffic conventions, and the signals and insignia by which people recognize each other. It includes style and taste, hairstyles and cosmetics, clothing styles and jewelry, patterns of eating and drinking, coffee breaks and cocktail hours, tobacco, marijuana, littering and jaywalking, obeying and disobeying the law, and coming or not coming to help if somebody is in distress.

I want to avoid any suggestion that there is some single mechanism that underlies all of these behaviors. Quite the contrary. In some cases people want to conform, in others they want to be different. Sometimes there is immunity in numbers—jaywalking or smoking marijuana or double-parking (the police cannot afford to ticket all the illegally parked cars if there

are many of them)—and other times too large a crowd spoils the fun. Sometimes people need to share a clandestine activity, and the outcome depends on whether there are penalties for revealing yourself to a stranger. Sometimes people want to associate with others who are older or richer or higher-ranked or who play better bridge or tennis; in other circumstances people are comfortable being older or richer or better; and sometimes the best is to be right in the middle. If everybody wants to stay home and watch the crowds in Times Square on television there will be no crowds in Times Square, while if everybody wants to join the crowd to be seen on television there will be nobody watching.

In the next chapter we examine a special class, an especially interesting class, of behavior patterns. These are patterns that have the characteristic of tending to be realized in the aggregate no matter how the individuals behave who comprise the aggregates. Musical chairs is an example: no matter how alert and aggressive the children are, one will be left chairless when the music stops. Poker is another: winnings and losses add to zero (less what one must pay for sandwiches) no matter how shrewdly people play their cards. Any one of us can get rid of Canadian quarters by passing them on, but collectively we cannot. A tenth of the students are always at the bottom 10 percent. And if you add up all the white neighbors of every black person in Boston, and add up the black neighbors of every white person in Boston, the numbers are identical as long as you are careful to use the same definitions of "neighbor," "Boston," "black," and "white," and to take both counts at the same time.

In Chapter 3 we shall look at a half dozen common models of behavior that social scientists use for insight into some of these processes. The number of different mechanisms is large but many recur repeatedly in widely different areas of activity. Some of these recurring models have proper names (reflecting the "naming phenomenon" I discussed earlier): "self-fulfilling prophecy," "critical mass," "the commons," "the market for lemons," the "acceleration principle." My purpose in leading

you into this subject will be clearer, if it is not transparent yet, after I have done my best in Chapter 3 to demonstrate the usefulness of some of the models that have been developed for exploring this rich and complicated subject.

Chapters 4 and 5 will then illustrate this mode of analysis in some detail by examining processes of "sorting and mixing," segregation and integration. Hardly any choices are as interactive and interdependent as the choice of whom to associate with, live with, work with, or play with, eat with or drink with or sit beside. Chapter 4 focuses on discrete classifications like race, color, sex, or language; Chapter 5 deals with classification by "continuous" variables, like age, income, or level of skill. Chapter 6 then looks at a set of choices that is not quite available yet, choices that may become available and may be drastically interdependent—like choosing the sex of one's children.

Finally, and more rigorously, Chapter 7 shows how some formal theory can be built on these ideas. It is a more demanding chapter than the others, slower to read, less readily comprehended. Like reading blueprints, reading the diagrams of that chapter can be mastered by almost anyone but only by working at it. I know no easier way to gain access to this richly variegated and universally significant subject. I hope the earlier chapters will have stirred the interest needed to attack and conquer the last one. Through most of the first six chapters, possibly excepting some diagrams toward the end of Chapter 4 and a little elementary algebra that shows up in Chapter 5, it should be possible to move right along, pausing occasionally, but more to reflect than to study. If you read Chapter 7 thinking it should be instantly transparent you will only become discouraged. Reading diagrams is a little like learning a language; fluency comes only with practice. Readers familiar with diagrammatic analysis from economics and elsewhere will still have to pause over the diagrams of Chapter 7; readers not so used to diagrams will have to pause a little longer. Just knowing that most of Chapter 7 is not meant to be instantly obvious is probably all the help you need.